SOUTHWEST FISHERIES SCIENCE CENTER
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Title of Accomplishment or Milestone: Sampling variability associated with estimates of species composition of tuna landings from the U.S. purse-seine fishery that operates in the South (central-western) Pacific Ocean.

Current Status of Accomplishment or Milestone: Preliminary analysis has been completed, i.e., estimates of species composition, and associated estimates of variance and optimum sample sizes, for U.S. purse fishery operations in 2001 have been determined and will be presented at the Highly Migratory Species (HMS) Data Coordination Working Group meeting in Honolulu, HI (April 2002).

Background: In 2001, over 112,000 mt of tuna, including yellowfin, bigeye, and skipjack tunas, were harvested by the U.S. purse-seine fishery that operates in the central-western Pacific Ocean and lands catches at ports in American Samoa. In the mid-1990s, purse-seine fishermen began using Fish Aggregation Devices (FADs) in efforts to increase catch rates associated with these tunas─prior to this time, fishermen primarily relied upon free-swimming school sets and log sets to concentrate tunas for capture. The FADs have had a considerable impact on both the species and size compositions associated with this fishery. Further, fish processing facilities (i.e, port-side canning operations where sampling takes place) do not typically provide accurate landing estimates on a species-by-species basis, e.g., fishing trips that unloaded mixed landings of both yellowfin and bigeye tunas would commonly be recorded as simply yellowfin landings. Thus, in efforts to objectively evaluate the species composition of the landings, multistage sampling designs were developed to provide data that would allow total landings to be accurately partitioned into individual species.

Purpose of Activity: To critically evaluate important management-related attributes of the U.S. purse-seine fishery in the central-western Pacific Ocean, including: (**1**) determining the variability associated with landing estimates of tuna (bigeye, yellowfin, and skipjack) generated from various sample strata, e.g., three set-type groups (free-swimming schools, logs, and FADs) for each of two, broad size categories (small fish less than 9 lb in size and large fish greater than 9 lb in size) within each of two sampling programs (a yellowfin/bigeye tuna sampling program and a skipjack tuna sampling program); and (**2**) determining optimum sample sizes for each of these sampling stratifications. The appropriateness of multistage sampling designs was investigated on the bases of the practical suitability of field procedures and the reliability of the derived estimates.

Description of Accomplishment (e.g., to the Center, to Management, and to NMFS Strategic Plan Goals) and significant results: Species-composition statistics associated with landings from the U.S. purse-seine fishery were largely estimated precisely, i.e., the vast majority of the estimates (in percent) in each of the sample strata had associated coefficients of variation of the mean (CVs) less than 10%. For example, the free-swimming school set-type group of the small fish category within the yellowfin/bigeye tuna sample stratum was composed of nearly 85% of yellowfin tuna and this estimate was very precise (CV=6%). The FAD set-type group of the small fish category within the yellowfin/bigeye tuna sample stratum was composed of similar amounts of both yellowfin (48%) and bigeye (53%) tunas, with both estimates being very precise (CVs <5%). Given the high precision associated with the estimates of species composition in 2001, current sample sizes are adequate. However, although sample estimates were found to be very reliable (associated with high precision), sampling teams were still recommended to distribute

data-collection effort throughout the fishing year to ensure collected samples are indeed representative (unbiased) of the statistical population-at-large (i.e., total, annual landings). The estimates of species composition (in percent) will be used to partition the total landings and ultimately, to develop catch time series for each of the tuna species. The estimates of variance associated with the catch time series can be accommodated in statistical assessment models for conducting sensitivity analysis.

Significance of Accomplishment: Sampling research is an integral component of fishery science and provides baseline information for conducting fish stock assessments. That is, catch-related time series are the foundation of population modeling efforts and are generally assumed to represent the most meaningful (say accurate) source of data in an assessment. Thus, it is imperative that scientific-based estimates of each species' contribution to the total landings be determined and made available on an ongoing basis to assessment analysts. Also, given the financial and logistical burdens associated with conducting fishery monitoring programs, it has become necessary to develop effective data collection plans that consider the statistical properties of the sample information, which ultimately, will assist management agencies when developing work schedules for sampling teams.

Problems: Although preliminary analysis has been completed, further evaluations of extended time series needs to be conducted to ensure management advice is based on representative sample information, e.g., include several years (1996-01) of data in the next phase of the research in efforts to evaluate year-to-year variation associated with these statistics. Finally, similar analysis needs to be conducted for detailed size-composition data collected from this fishery, given the importance of size/age-based information in current assessment modeling.

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